Application Number: 10/016,609   Attorney Docket Number: 164147.01

Amendments to the Claims:

· This listing of claims will replace all prior versions, and listings of claims in the
application. Applicant has submitted a new complete claim set showing any marked up
claims with insertions indicated by underlining and deletions indicated by strikeouts
and/or double bracketing.

Listing of Claims:

1.   (currently amended) A method to ~~transform non-self-describing~~ configure
transport segments of a transport-level protocol ~~into self-describing segments~~ for
transporting an upper layer protocol transfer, where the transport-level protocol is
layered above a network-level protocol, and where each transport segment comprises a
standard transport header and a body separate from and following the standard
transport header, the method comprising the steps of:

receiving upper layer segments which are segments of the upper layer protocol,
where each upper layer segment includes a respective original remote direct memory
location indicating where to place its payload directly into remote memory;

determining that at least some of the received upper layer segments do not
integrally fit within transport segments and in response splitting those upper layer
segments to create split segments;

aligning framing headers with the ~~non-self-describing~~ transport segments by
putting a framing header in the body of each transport segment that carries a split
segment ~~corresponding data for the upper layer protocol transfer~~; and

putting segment description information in each framing header, the segment
description information indicating a remote direct memory location for the
~~corresponding data of the upper layer protocol transfer~~ split segment that is being
carried by the segment, where the remote direct memory location is determined based

on the original remote direct memory location of the corresponding upper layer
segment from which the split segment was obtained, and where the remote direct
memory location in the framing header allows direct placement in remote memory.

2.   (currently amended) The method of claim 1 further comprising the step of
limiting an upper layer protocol data unit size to the smaller of a maximum transport
segment size and a size that will fit within the non self-describing segments.

3.   (cancelled)

4.   (currently amended) The method of claim 1, wherein the direct memory location
put in the framing header comprises further comprising the step of putting a
destination buffer id and an offset within the identified buffer in the non self-describing
segments.

5.   (currently amended) The method of claim 1, wherein the direct memory location
put in the framing header comprises further comprising the step of putting a destination
buffer id and a destination memory address in the non self-describing segments.

6.   (currently amended) A computer-readable medium having computer executable
instructions for performing one or more steps to transform non-self-describing
configure transport segments of a transport protocol to self-describing segments for
transporting upper layer protocol (ULP) protocol data units (PDUs), where the transport-
level protocol is layered above a network-level protocol, and where the transport
segments each comprise a standard transport header and a separate body following the
standard transport header, the one or more steps comprising:

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receiving upper layer PDUs which are PDUs of the upper layer protocol, where each upper layer PDU includes a respective original remote direct memory location indicating where to place its payload directly into remote memory;

determining that at least some of the received upper layer PDUs do not integrally fit within transport segments and in response splitting those upper layer PDUs to create split PDUs; and

aligning the upper layer protocol with the transport protocol by ~~ensuring that~~ placing, in the body of ~~each~~ transport segment~~s~~, ~~that transports data for the upper layer protocol is provided with~~ one or more ~~corresponding integral ULP PDUs~~ split PDUs that each has a respective header comprising segment description information indicating a remote direct memory location for corresponding data of the ULP, where the remote direct memory location is determined based on the original remote direct memory location of the corresponding upper layer PDU from which the split PDU was obtained, and where the remote direct memory location in the framing header allows direct placement in remote memory.

7.   (cancelled)

8.   (currently amended) The computer-readable medium of claim 6 having further computer executable instructions for performing a step of putting zero-copy information in a non self-describing transport segment.

9.   (currently amended) The computer-readable medium of claim 6, wherein the direct memory location of the split PDU comprises ~~having further computer executable instructions for performing a step of putting a destination buffer id and~~ a destination memory address ~~in a non self-describing segment~~.

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10.   (currently amended) The computer-readable medium of claim 6, wherein the direct memory location comprises ~~having further computer executable instructions for performing a step of putting~~ a destination buffer id and a data size and offset in the identified destination buffer ~~a non self-describing segment~~.

11.   (currently amended) A method to ~~transform non-self-describing~~ configure transport segments of a transport protocol ~~to self-describing segments~~ for transporting upper layer protocol (ULP) protocol data units (PDUs), where the transport-level protocol is layered above a network-level protocol, and where the transport segments each comprise a standard transport header and a body separate from and following the standard transport header, the method comprising the step of:

receiving upper layer PDUs which are PDUs of the upper layer protocol, where each upper layer PDU includes a respective original remote direct memory location indicating where to its payload belongs in remote memory;

determining that at least some of the received upper layer PDUs do not integrally fit within transport segments and in response splitting those upper layer PDUs to create split PDUs; and

ensuring that the body of each transport segment that transports data for the upper layer protocol is provided with one or more corresponding integral ULP PDUs that each has a header comprising segment description information indicating a remote direct memory location for corresponding data of the upper layer protocol, where at least some of the integral ULP PDUs are split PDUs whose remote direct memory locations are determined based on the original remote direct memory locations of the respective upper layer PDUs from which the split PDUs were obtained, and where the remote direct memory locations allow direct placement in remote memory.

12.   (cancelled)

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13.   (currently amended) The method of claim 11 further comprising a step of putting zero-copy information in a ~~non-self-describing~~ transport segment carrying a split PDU.

14.   (currently amended) The method of claim 11 wherein the segment description information in the header includes a ~~destination buffer id and a~~ destination memory address.

15.   (currently amended) The method of claim 11 wherein the segment description information in the header includes a data size and an offset in the ~~non-self-describing~~ transport segment.

16.   (currently amended) A method of sending data via a network between an upper layer sender and an upper layer receiver through a transport that implements a transport-level protocol and that sends data in transport segments, where the transport-level protocol is layered above a network-level protocol and below the upper layer sender and upper layer receiver, and where each segment comprises a standard transport header and a body separate from and following the standard transport header the method comprising the steps of:

     receiving upper layer segments which are segments of the upper layer protocol, where each upper layer segment includes a respective original remote direct memory location indicating where to place its payload directly into remote memory; and

     determining if transport segments are too small to carry at least some of the upper layer ~~non-self-describing~~ segments, and when a transport segment is determined to be ~~a non-self-describing transport segment~~ too small:

         splitting upper layer segments into split segments and providing split segments with ~~obtaining~~ framing headers containing segment description information indicating ~~a~~ respective remote direct memory locations for upper layer data framed by ~~a~~ the framing headers;

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~~aligning the framing header with the transport segment by~~ ensuring that each ~~the~~ framing header and all of the corresponding upper layer data framed thereby are integrally put in the ~~body~~ bodies of ~~the same~~ transport segment<u>s</u>; and

putting the segment description information in the framing header; and

sending the transport segment to the upper layer receiver.

17.   (cancelled)

18.   (currently amended) The method of claim 16 ~~wherein the data comprises at least one upper layer protocol data unit and~~, where the method further comprises ensuring that only an integral number of upper layer ~~protocol data units~~ segments are put into the transport segment.

19.   (cancelled)

20.   (currently amended) A network interface card comprising:

memory buffers for receiving transport segments of a transport-level protocol that is layered above a network-level protocol, where each segment comprises a standard transport header and a body separate from and following the standard transport header;

a processing unit in communication with the memory buffers, the processing unit comprising a first module for detecting if ~~transport~~ segments of ~~the transport~~ an upper level protocol ~~are non self-describing~~ do not fit in transport segments; and

a second module for splitting a split segment from an upper level segment detected to not fit in a transport segment, providing the split segment with a header, ~~obtaining segment description information and~~ and putting ~~the~~ segment description information in ~~a header aligned with a transport segment detected to be a non self describing segment~~ the header of the split segment, where the header is put in the body

of the transport segment, where all data corresponding to the header is ensured to be encapsulated in the body of the transport segment, and where the segment description information indicates a remote direct memory location of that data, and where the remote direct memory location is determined from the upper level segment from which the split segment was split.

21.   (currently amended) The network interface card of claim 20 wherein the processing unit aligns the header with the ~~non-self-describing~~ transport segment's header.

22.   (currently amended) The network interface card of claim 20 wherein the processing unit limits an upper layer protocol data size to the smaller of a maximum transport segment size and a size that will fit within the ~~non-self-describing~~ transport segment.

23.   (cancelled).

24.   (currently amended) A network interface card comprising:

    memory buffers for receiving transport segments of a transport-level protocol that is layered above a network-level protocol, where each segment comprises a standard transport header and a body separate from and following the standard transport header; and

    a processing unit in communication with the memory buffers, the processing unit performing the steps of:

        detecting if ~~transport~~ segments of ~~the transport~~ an upper level protocol ~~are non-self-describing~~ do not fit in a transport segment; and

        if a transport segment is detected to be a non self-describing segment:

splitting a split segment from an upper level segment detected to not fit in a transport segment;

providing the split segment with a header; and

~~obtaining segment description information; and~~

putting ~~the~~ segment description information in ~~a~~ the header of the split segment, ~~aligned with the transport segment,~~ where the header is put in the body of the transport segment, where all upper level data corresponding to the header is ensured to be encapsulated in the body of the transport segment, ~~and~~ where the segment description information indicates a remote direct memory location of that data, and where the remote direct memory location is determined from the upper level segment from which the split segment was split.

25.   (currently amended) The network interface card of claim 24 wherein the processing unit aligns the header with the ~~non-self-describing~~ transport segment's header.

26.   (cancelled)

27.   (cancelled).